

WHAT IS CLAIMED IS:

1 1. Apparatus for selectively receiving a radio frequency (RF) signal,
2 comprising:
3 an array of antenna elements for receiving the RF signal;
4 a navigational controller for determining a pointing vector from
5 coordinate information; and
6 beam-forming electronics connected to the array of antenna elements and
the navigational controller for forming reception lobes.

2 2. The apparatus of claim 1, wherein the elements of the array comprise
dual-frequency patch elements.

3 3. The apparatus of claim 1, wherein the beam-forming electronics form the
reception lobes by adjusting the phase of the elements of the array.

4 4. The apparatus of claim 1, further comprising an antenna output from the
beam-forming electronics.

5 5. The apparatus of claim 1, wherein the elements of the array are arranged
in a symmetric configuration.

6 6. The apparatus of claim 5, wherein the elements of the array are arranged
in a radially symmetric configuration.

7 7. The apparatus of claim 1, wherein the RF signals comprise signals from
at least one global positioning system (GPS) satellite and the pointing vector
comprises a satellite pointing vector.

1 8. The apparatus of claim 1, wherein the reception lobes have a width of 25
2 degrees or less.

1 9. The apparatus of claim 1, wherein said beam-forming electronics
2 comprises:

3 at least one phase shifter connected to the array of antenna elements for
4 shifting the phase of the received RF signal; and

5 a beam-forming algorithm processor connected to the at least one phase
6 shifter and the navigational controller for calculating an amount by which the at
7 least one phase shifter shifts the received RF signals in response to the pointing
8 vector.

9 10. The apparatus of claim 9, wherein the at least one phase shifter
10 comprises an array of phase shifters.

11 11. The apparatus of claim 10, wherein said beam-forming electronics
12 comprises a means for summing outputs of each phase shifter of the array of phase
13 shifters.

1 12. The apparatus claim 11, further comprising an antenna output from
2 said means for summing outputs of each phase shifter, of the beam-forming
3 electronics.

1 13. The apparatus of claim 9, wherein the output of the phase shifters
2 constructively amplifies selectively received RF signals by an amplification factor
3 by aligning selective reception lobes of each element of the array of antenna
4 elements, while interference signals from undesired sources are combined by the

1 phase shifters in a random manner, such that the interference signals experience
2 essentially no amplification.

1 14. The apparatus of claim 13, wherein the constructive amplification
2 amplifies desired, selectively received RF signals by at least 12 dB.

1 15. The apparatus of claim 13, wherein the interference signals have a
2 strength of -30 dB.

1 16. The apparatus of claim 1, wherein the navigational controller
2 comprises:

3 a receiver for receiving RF signal transmissions conveying absolute
4 position information of the apparatus;

5 an inertial measurement unit (IMU) for measuring changes in relative
6 position of the apparatus; and

7 a navigation processor connected to the receiver, the IMU, and the
8 beam-forming algorithm processor for receiving absolute and relative position
9 information from the receiver and the IMU, and calculating the pointing vector
10 from the absolute and relative position information, and transmitting the pointing
11 vector to the beam-forming algorithm processor.

1 17. The apparatus of claim 16, wherein the receiver comprises a GPS
2 receiver.

1 18. The apparatus of claim 17, wherein the GPS receiver contains
2 satellite almanac information comprising location information of satellites.

1 19. The apparatus of claim 16, wherein the IMU comprises a vibrational
2 sensor.

1 20. The apparatus of claim 16, wherein the IMU comprises a gyroscopic
2 sensor.

1 21. The apparatus of claim 20, wherein the gyroscopic sensor comprises
2 a laser gyroscopic sensor.

22. The apparatus of claim 16, wherein the IMU comprises an
accelerometer.

23. The apparatus of claim 16, wherein the IMU is a micro-machined
device.

24. The apparatus of claim 16, wherein the relative position information
comprises a change in velocity.

1 25. The apparatus of claim 16, wherein the relative position information
2 comprises a change in angle.

1 26. The apparatus of claim 16, wherein the navigation processor is
2 connected to a host.

1 27. The apparatus of claim 26, wherein the connection with the host
2 provides input and output (I/O) communications between the navigation processor
3 and the host.

1 ~~28.~~ The apparatus of claim 16, wherein the satellite pointing vector is
2 updated using a pre-determined refresh rate.

1 30. The apparatus of claim 28, wherein the refresh rate corresponds to an
2 update rate of the reception lobes.

2 2 3 4 5 6 7 8 2

1 33. The method of claim 31, wherein the step of determining is
2 accomplished using actual coordinate information.

1 35. The method of claim 31, wherein the step of forming the reception
2 lobes is accomplished by shifting the phase of an RF signal received in the step of
3 receiving.

1 36. The method of claim 31, further comprising the steps of:
2 shifting the phase of signals from antenna elements in the array to obtain
3 phase-shifted signals; and
4 summing the phase-shifted signals obtained in the step of shifting in a
5 manner such that desired RF signals in the direction of the pointing vector are
6 constructively summed, providing an effective amplification of the desired RF
7 signals, while interference RF signals not in the direction of the pointing vector
8 are not effectively amplified due to random shifting of the interference RF signals.

09902095 071101
TOT 20 56020660